

METHOD AND SYSTEM FOR REGULATING POWER IN PORTABLE AUDIO/VIDEO PLAYBACK DEVICE

BACKGROUND OF THE INVENTION

1. Field of the invention

5 The present invention relates to a method and a system for regulating power in a portable audio/video playback device, and particularly, to a method and a system for a complete playback of an audio/video multimedia file or data by power regulation provided that the power supplied to a portable audio/video playback device is insufficient.

2. Description of the related art

10 As technology changes rapidly, audio and video devices are now in widespread use and multimedia players have become indispensable to everyday life in modern society. For example, household television sets, VCD/DVD players and various stereo systems are all designed to provide the users with
15 better audio and video pleasures. Thanks to technology development, audio and video devices have been gradually miniaturized, and thus a portable audio/video player has been proposed, which makes it possible for the users to watch and listen to a multimedia file or data in the outdoors. However, such a portable audio/video player is usually subject to the limitation of power supply
20 and therefore is very inconvenient in use.

 In a portable audio/video player, such as an MP3 player or a notebook computer, in the current market, a battery is installed therein to provide the power required for the playback of the multimedia file or data. However, without an external charger, the battery usually lasts only about two hours.
25 For example, an independent power supplied only by a battery of a notebook

computer usually runs out before the completion of the playback of a film recorded in DVD format. Such a playback interruption depresses the user and creates an uncomfortable experience.

In the prior art, attempts for improving the structure of a battery to thus
5 enhance the power duration thereof have been proposed. Alternatively, an external power saving device appended to the portable audio/video player has also been proposed to minimize the power consumption thereof. However, such methods or devices still fail to provide a solution for a user to watch a film or listen to a song completely. That is, the playback of the multimedia file
10 will be interrupted when the power runs out, which impresses the user with an uncomfortable experience.

As can be seen from the description, the independent power of a conventional portable audio/video players is easily exhausted, which causes a playback interruption of a film or a song. The failure to provide a user with a
15 complete audio or video pleasure makes it inconvenient in use. In the light of the above, the inventor has employed technical ideas and developed an innovative invention with reasonable design to improve the drawbacks.

SUMMARY OF THE INVENTION

The object of the present invention is to provide a method and a system
20 for regulating power in a portable audio/video playback device, which enables the portable audio/video playback device to completely play an audio/video multimedia file or data before the power is exhausted. The method mainly comprises: detecting a present remaining power α in the power unit; reading an audio/video multimedia file or data and computing a playback time β of the file
25 or data; computing an average power consumption rate γ of the portable

audio/video playback device; and computing whether the present remaining power α is sufficient for a complete playback of the audio/video multimedia file or data, and, if the present remaining power α is not sufficient for a complete playback of the audio/video multimedia file or data, then reducing an output level of a video or audio output signal so that the complete playback of the audio/video multimedia file or data may be accomplished prior to exhaustion of the power.

BRIEF DESCRIPTION OF THE DRAWINGS

Features and advantages of the present invention will be fully understood from the detailed description to follow taken in conjunction with the embodiments as illustrated in the accompanying drawings, which are to be considered in all respects as illustrative and not restrictive, wherein:

Figure 1 schematically shows the structure of a portable audio/video playback device;

Figure 2 is a block diagram of a portable audio/video playback device according to the present invention; and

Figure 3 is a flow chart for explaining the operation of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

The present invention relates to a method and a system for regulating power in a portable audio/video playback device to accomplish a complete playback of an audio/video multimedia file or data before the power is exhausted. To begin with, please refer to Figure 1, which schematically shows the structure of a portable audio/video playback device 10. In this

embodiment, a portable computer is disclosed for illustrative purpose only and is not intended limit the scope of the invention. In practice, the invention may be applied to an MP3 player or any of a variety of portable multimedia players.

In the portable audio/video playback device 10, a power unit 19 is
5 provided for supplying electric power to the portable audio/video playback device 10. As an optical disk 12 containing an audio/video multimedia file or data is inserted into an audio/video playback unit 11 by a user, the audio/video playback unit 11 is controlled by a processing unit 13 provided in the portable audio/video playback device 10 to read the audio/video multimedia file or data.
10 A video signal (image signal) and an audio signal (sound signal) may be obtained from the audio/video multimedia file or data through a decoding process conducted by the processing unit 13. The video signal and the audio signal are then passed to a video unit 17 and an audio unit 15, respectively, for further processing to form video and audio playback output signals. In this
15 embodiment, the audio/video playback unit 101 may be a VCD/DVD player, and the power unit 19 may be a battery.

Referring to Figure 2, a block diagram of the portable audio/video playback device 100 according to the present invention is shown. The power unit 109 is connected to the audio/video playback unit 101, the processing unit
20 103, the audio unit 105 and the video unit 107 to supply these units with the electric power required for operation. The processing unit 103 detects a present remaining power α in the power unit 109 at a predetermined time interval to determine whether the power state of the power unit 109 is sufficient or insufficient. The time interval may be set to 3 minutes or 5 minutes for
25 example.

A processing unit 103 is provided in the portable audio/video playback

device 100 and is connected with the audio/video playback unit 101, the audio unit 105, the video unit 107 and the power unit 109. Through the connection between the processing unit 103 and the audio/video playback unit 101, a playback time β (or remaining time) for the audio/video multimedia file or data can be instantaneously determined. Meanwhile, the processing unit 103 also computes an average power consumption rate γ of the portable audio/video playback device 100 to thereby determine whether or not the present remaining power α is sufficient to complete the playback of the audio/video multimedia file or data.

If a computation by the processing unit 103 shows that the remaining power α divided by the average power consumption rate γ is small than the playback time β , then an instruction signal is issued to the audio unit 105 and the video unit 107 to reduce the output level of the video and audio output signals produced by these two units (the audio unit 105 and the video unit 107).

First, one of the pins of the audio unit 105 is connected to the processing unit 103 to receive the instruction signal, and thus the audio output signal of the audio unit 105 may be reduced. For example, the power consumption rate of the portable audio/video playback device 100 may be reduced by reducing the output volume or special audio effect of the audio unit 105. Similarly, by connecting one of the pins of the video unit 107 to the processing unit 103, the brightness, contrast, resolution or special playback effect of the video output signal produced by the video unit 107 may be controlled at a lower level to thereby extend the power supply duration of the power unit 109.

Moreover, the processing unit 103 may lower the decoding completeness of the audio/video multimedia file or data to reduce the power consumption rate of the portable audio/video playback device 100. This is because

reducing the decoding completeness can reduce the CPU usage so as to lower the CPU working voltage for saving power. In accordance with the commonly used technology, an audio sampling rate is 44.1 KHz or higher, and a video compression ratio is compressed or decoded based on MPEG4 format.

5 By lowering the audio sampling rate and the video compression ratio, the audio/video decoding completeness may be reduced, and thus the power supply duration of the power unit 109 is increased so that the remaining operable time of the power unit 109 becomes greater than the playback time β .

After the output level of the video and audio output signals is
10 automatically reduced in the system, the processing unit 103 continues to compute at a predetermined time interval whether the present power is sufficient to complete the playback of the audio/video multimedia file or data. Since the output level changes, the playback time β and the average power consumption rate γ also change by an increment of the playback time $\Delta\beta$ and an
15 increment of the average power consumption rate $\Delta\gamma$, respectively. At this time, the processing unit 103 computes whether $\alpha/(\gamma-\Delta\gamma)$ is greater than or equal to $(\beta-\Delta\beta)$. If $\alpha/(\gamma-\Delta\gamma) \geq (\beta-\Delta\beta)$, then the system stops lowering the output level of the video and audio signals.

On the other hand, if $\alpha/(\gamma-\Delta\gamma) < (\beta-\Delta\beta)$, then other output values are further
20 adjusted to minimize the power consumption rate, for example, by lowering the frequency of the processing unit 103 or by switching off special playback effect that may consumes more power, so as to satisfy the condition $\alpha/(\gamma-\Delta\gamma) \geq (\beta-\Delta\beta)$. At last, if it still fails to reach a state that satisfies the above condition, then the playback speed of the audio/video playback unit 101 may be increased to
25 shorten the required playback time for the audio/video multimedia file or data so that a complete playback of the audio/video multimedia file or data can be

accomplished by the portable audio/video playback device 100 before the power is exhausted. However, the above output signals are not allowed to be reduced to a level lower than a predetermined limit value, because bad qualities of video and audio signals will not be acceptable by the users.

5 In the above preferred embodiment, in order to reduce the power consumption rate, several means have been proposed. These means include lowering brightness so as to reduce the power consumption of an LCD monitor, lowering volume so as to reduce the power consumption of a speaker, accelerating playback speed so as to shorten the playback time and thus reduce
10 the total power consumption, lowering CPU speed by lowering CPU working voltage so as to reduce the power consumption of the processor, lowering decoding quality, and turning off the audio/visual effect that consumes extra power. Among the above, lowering decoding quality is to lower decoding completeness and to output unfully decoded data to the audience. Although
15 the output quality thus obtained is worse than the fully decoded one, it requires less CPU usage and hence the power supplied to the CPU can be further reduced as described above.

It should be noted that lowering CPU usage itself does not result in power saving, but lowering the CPU working voltage does. For the same reason,
20 power saving is not accomplished by merely turning off extra audio/visual effect, and the CPU working voltage must be further lowered to achieve the purpose. Furthermore, the power consumption cannot be reduced by simply lowering audio sampling rate or visual resolution while the speaker or the LCD is still outputting signals, and, to save power, the volume of the speaker or the
25 brightness of the display must be lowered.

Referring to Figure 3, a flow chart for explaining the operation of the

present invention is shown. First, the remaining power α of the power unit 109 is detected by the processing unit 103 (S201). Next, an audio/video multimedia file or data is read into the system and the processing unit 103 computes the playback time β of the file or data (S203). Meanwhile, the processing unit 103 computes the average power consumption rate γ of the portable audio/video playback device 10 (S205). Finally, if it is determined that the present remaining power α is not sufficient for the complete playback of the audio/video multimedia file or data, then the output level of the video or audio output signals (S207) may be lowered to thereby reduce the power consumption rate of the portable audio/video playback device 100 so that a complete playback of the audio/video multimedia file or data can be performed by the portable audio/video playback device 100.

In summary, with the method and the system for regulating power in the portable audio/video playback device 100, unnecessary power consumption may be effectively reduced so that the complete playback audio/video multimedia file or data can be accomplished by the portable audio/video playback device 100 before the power is exhausted. Accordingly, playback interruption of the audio/video multimedia file or data due to power exhaustion may be avoided and therefore protects the user from feeling uncomfortable.

While the present invention has been described with reference to the detailed description and the drawings of the preferred embodiments thereof, it is to be understood that the invention should not be considered as limited thereby. Various modifications and changes could be conceived of by those skilled in the art without departing from the scope of the present invention, which is indicated by the appended claims.